"THE SUN SHALL BE DARKENED"

To-Morrow's Eclipse of the Great Luminary.

IN THE LUNAR SHADOW.

Descriptions and Diagrams of an Imposing Phenomenon.

TOTAL, ANNULAR AND PARTIAL ECLIPSES.

Elliptical Orbits of the Earth and Moon and Their Planes.

NINETEEN MILES PER SECOND.

The Path of Totality from Siberia to St. Domingo.

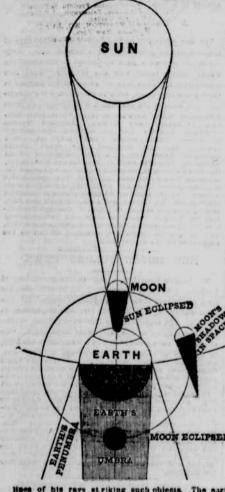
VIEWED IN NEW YORK.

How the Different Solar Phenomena May Be Observed.

BY PHOTOGRAPHY, TELESCOPE AND SMOKED GLASS

A rare and magnificent spectacle-the eclipse of the Over the greater part of the North American continent the corpse will be a partial one-that is to by that of the moon. But along a comparatively very narrow belt or zone, extending from Eastern Siberia to the Carribean Sea, southeast of the island of St Domingo, and having within the United States a lotal one-that is, the whole of the sun's disk will be obscured for several minutes at each point. An even of so much interest to astronomers cannot fail to attract attention from a large number of scientific men, and, judging from the timely and ample prepare tions made for a series of observations along the path of totality, the most important results to science may be expected from the labors of the observation par

THE CAUSE OF A SOLAR ECLIPSE. As the general render may not have either the time causes and attendant phenomens of a solar eclipse it is deemed proper to present in the HERALD a brief description of these, so that the popular interest in the event may be based on an intelligent appreation of all the facts relating to it. It becomes all the more necessary to do this in view of the discoveries that probably will by the observing astronomers in relation to the physical constitution of the sun. the character of the corons and a hunared other important subjects which improved instruments will afford an opportunity for investigating such as never peters presented itself. To understand the nature of these discoveries and their bearing on the knowledge iready attained concerning the sun it is necessary to glance over the principal facts which are now recognized as among the canons of the universally accepted law of the selar system. reduce cause of the eclipse of the sun being the disk of the latter should be temporarily obscured to a small area of the earth's surface. As the sun is be shines cast a shadow in direct prolongation of the

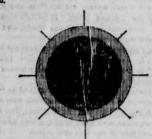


presenting a circular surface of much smaller diameer than the sun's, casts a vast conical shadow into space; the moon another, but relatively much their satellites, so that, as above stated, every body exposed to the sun's rays casts a shadow which is in the direct line of its prolongation. Now, whenever any planetary body, such as the earth, in moving along its orbit passes into the conical shadow east by any other similar body, such as the moon, the former has all or a part of its area exposed to the sun cut off from the sun's light by the interposition of the body in whose shadow it ir, and consequently the sun is eclipsed wholly or partly to all observers within the shadowed area. is proper to say wholly or partly, because from all shadow, which are respectively the umbra or the direct shadow or cone of daraness whose base is the sectional area of the body casting it and whose apex will be the point where the lines of light from the circumference of the sun loughing the corresponding portions of the circumference of the body, converge beyond it in space, and the penumbra or indirect shadow, which is a truncated cone whose top corresponds in area with the base of the umbra, but whose base is lost in illimitable space or seats on the body which intercepis it, as the surface of the earth intercepts the penumbra of the moon, This she dow is caused by the transversion of the marginal rays of the sun to the opposite points on the circumier ence of the body by which the shadow lines so formed diverge beyond it instead of convergite, as in the case of the umura. The diagram shows the relations between the two shadows and their causes.

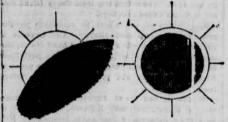
A VIEW PROM THE BUN. If sm observer could be stationed on the sun during a total colless he would see the moon pass over the disk of the earth as a bright-spot on a bright surface, because both the moon and the earth would be re-

a faint shadow due to the penumbra which woulst would be apparently covered by the moon. If the observer stood in the centre of the sun's disk, he would see this faint shadow or annulus surrounding the moon equally at all points of her circumference. But if he moved in any direction from the centre of the so ar disk ne would perceive an increase of the indirect shadow of the moon on the earth's surface in the same direction, while if he stood at a point on the arcumierence of the sun he would see the penumbra only on one and the corresponding side of the moon's disk. In no case could be see the umbra or direct shadow, because it is within the cone of rays coming from every part of the solar hemisphere, and consethe sun no matter what his position.

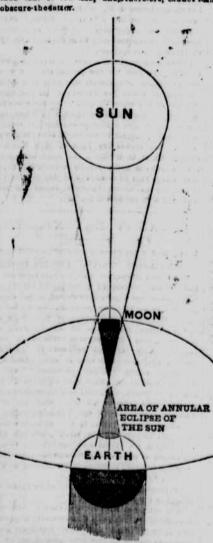
TOTAL, PARTIAL AND ANNULAR ECLIPSES A glance at the diagram will show the reader that to an observer stationed within the area of the umbra



He will also perceive that to any one standing outside the umbral and within the penumbral area the sun i sust be partially eclipsed. These facts can be demonstrated by drawing lines from any such points tang ental to the moon. It will be be found that in the first case such lines continued toward the sun will only touch or fall outside his ence, while in the second case one of them will fall within and the other without the sun's cirthe charver as the cutside the angle formed by these lines. If an observer stand on the exact edge of the brai or indirect shadow area the sun will not be eclipsed to him, but the circumferences of the him move a little within the shadow, and he will observe that the lunar disk advances on and of. source the selar disk, and that this obecuration in creases as he-moves toward the centre of the area of



the zone to be traversed by the umbra during a sen t themselves in the following order:-First con tast, when the margin of the advancing penum bra obscuration while he is within the penumbra : to. ted obscuration when the margin of the umbra wohen his station, and this total obscuration lasts while the observer is envelop d by the umbra: brat is again moving over the station; final contact. foll swed immediately by complete visibility, when pass we away. To an observer outside the area of the umbits the phases of the ecupse would not embrag totality, but would be limited to the con and a gradual increese and decreese taote which would be attained when the observer's av .tior is furthe at inward from the margin of the per a mora. There is, however, another kind of solar colles a which deserver attention because of its very remark s ble and rare featt rev. This is the annular eclipse, so is slied because wha'e the centres of the moon and sun coincide annulus or ring of unobstructed sunlight sucrounds the dark disk of the moon when 'me ecuipse is at its height. How is th's brought about? Shuply enough when the conditions are investigated. It will be remembe red that the moon's direct conical shadow projec a within the prolongation of the sun's direct rays. As the latter converge their point of union as it . sere marks the apex of the cone of shadow cast by the moon. It is clear that unless a body on which at a observer is stationed comes within this cone, which is limited in size as explained, such an observer can. not experience a total ecl mse of the sun. than that of the sun, and cons squently totally covers and obscures it. Without the come only a part of the moon's disc covers that of the sun; consequently there is only a partial cell ose. But if an observer is stationed at a point on Vac profongation of the axis of the moon's cone of sh'adow he will be in such a position that the moon's disk will appear to him smaller than that of the san, and, therefore, cannot totally obscure-thedataer.



of bright sunlight from the unobscured perion of the soher disk, and the width of this ring will increase with the observer's distance from the apex of the moon's cone of direct shadow. The area within which an annular eclipse can be observed is itmited aisa by this distance. There is only one point where the annulus is perfect—that is to say, of equal width around the moon. That point is the one we have assumed to be eccupied by the charryer in the first instance. It the sides of the cone of direct shadow are prolonged beyond their intersection or the apex of the cone another cone will be formed whose base will be the circular area within which an annular eclipse can be observed, and whose height will be equal to the distance between the apax of the cone of direct shadow rand the surface of the earth. On the margin of shis base the the the moon's disk would appear surrounded by | moon's disk will be seen in internal contact with the

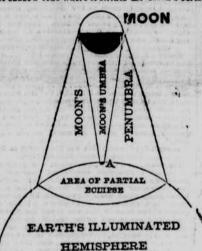
sun, while a crescent shaped surface will remain exposed on the opposite side.

ECLIPSES, LUNAR AND TERRESTRIAL ORBITS. Having explained briefly the immediate causes of lipses of the sun the reader will new consider the these phenomens and the peculiar relative positions assumed by these bodies with regard to each other and to the sun which immediately precede and attend eclipses. The earth in its annual movement around the sun 18 365 days, 6 hours, 9 minutes, 1,075-100 seconds. Jo ume the earth makes the full circuit of its the ellipse so described the sun ferms one of the from the earth has been recently calcu-from observations of the transit of millions of miles less than the distance previously accepted by astronomers as correct. The average rate of movement of the earth on its elliptical orbit is estimated at 68,000 miles an hour. This gives a direct second. Now, travelling, as it does, on the circuluference of an ellipse of which the sun is at one locus, the distance between the earth and the sun is soon stantly changing, as also is Une rate of the earth's

fle moon, being the earth's satellite, revolves around her, also following an elliptical course, of which the earth is one of the foci, by reason of which the moon's distance from the earth and her apparent moon around the earth forms with that of the earth around the sun of the ecliptic an angle of five degrees, and in its monthly revolution intersects the art h's orbit twice, its rolative rate of motion per to in degrees is to one degree. It follows that at cer-Fun periods it assumes a position with relation to the sun and to the earth which place it in conjunction with or opposition to the former. When the moon is on noder, which are distinguished by the terms "ag sending node" when the moon is passing from the node" when it is passing from the north to the soul of that line. It the estiptic was in the same plane as the moon's orbit there would be eclipses per lupar monab-one of the aun and one of the moon. Owing, however, to the non-coincidence of the two planes the lunar shadow at new moon and the earth's shadow at full moon do as they must do to cause eclipses of the sun and It the nodes remained unchanged in their relation to the sun there would either be bimonthly eclipses or none at all; but as they constantly change with the earth's and moon's courses along elliptical orbits, eclipses cannot occur unless the phases of new and full moon coincide with the moon is very near, but not exactly, at the nodesthat is, when the earth is in the moon's penumbra, or the moon in that of the earth.

Appular eclipses of the sun occur when the phase of new meon corresponds with the node and when she is at such a distance from the earth that the spex of her cone of shadow does not reach the surface of

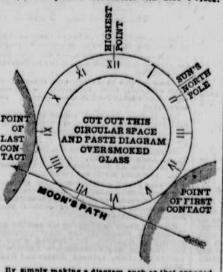
This is determined by the direction taken over the surface of the rotating earth by the umbra of the rives at that point where the moon's cone of shadow east. The motion of the moon from east to west, in combination with that of the earth and the fixed centre zone of a width which is equal to the diameter o the shadow cone where it strikes the earth's surface



A-Area of total eclipse. The penumbra being of very much gre der area

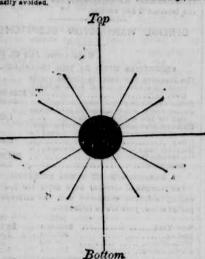
overlies a vast extent of territory and tra cos a wif io zone whose limits are about parallel with ' be line of totality. A periect knowledge of the me sements of the moon and earth enables astronomer , to calculate with extraordinary exactness the path of totality and the width of the zone of Partial collins, Rence we are told, yours in advance of the event, in what 'parts of the world an eclipse will be testal, partial or invisible. According to such calculations accurate information has already been published by the authorities of the "Nautical Almanac" office, at Washington, respecting the coming total enlipse. The path of totality is given as follows :- "Commonding in the Province of Leoutek, Siberia, in latitude 54 deg. 14 min north, longitude 117 deg. 32 min. east from Greenwich. Its course will be at first eastnortheast, but will gradually change to east, and after leaving Asia to southeast. It will cross Behring's Straits in north latitude of deg. 40 min., in an easterly direction, passing a little northeast of Fitks, across the British possessions toward, the southeast and enter the United States in long. tude 38 deg. we at from Washington. In this country it will sweep over the western end of Montana Ferritory, the National Park, Yellowstone Valley, Wy oming Terrwory, Denver, Col., and Northern and Eastern Textis, entering the Gult of Mexico, between New Orleans and Galveston. It will then pass over most of the island of Cuba and Southern St. Dr. mingo, and leave the earth a little southeast of the latter island. Within this country the broadth (diameter) of the moon's direct shadow will be about one, hundred and sixteen miles." THE ECLIPSE AT NEW YORK.

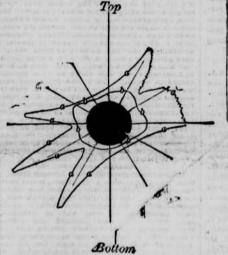
Observers at New York city will witness a partial schose of the sun's southern limb or semi-disk. The obscuration will commence at 4 hours 47.4 minutes P. M., and will end at 6 hours 33.3 minutes P. M. The first contact will take piece at a point on the sun's western limb, about due west, or 136 degrees from the highest point of the sun's circumference, au 1 83 degrees from the solar north pole. This makes the sun's axis assume an angle of 53 degrees with a vertical line passing through his centre. If a watch is held up under the sun, and with the dial toward the observer, the poir,t of first contact will correspond with that of half past four, and the point last contact with nine o'c reck



and cutting out of its centre a round opening, and pasting it over a piece of smoked or blue glass, the point of first and last contact can be fixed before the

OFFICIAL INSTRUCTIONS FOR OBSERVING THE ECLIPSE. The following official instructions have been issued amateur observers. Although they are important only to those stationed within the path of totality they convey many interesting points of information to the general reader and are particularly useful to the students who are reading elementary treatises on





of the sector corona fade away so gradually that it will be impossible corona fade away so gradually that it will be impossible to say precisely where they terminate. This shown all the corona fade away so gradually that it will be impossible to say precisely where they terminate. This shown all the corona may not be served earliers to cake a faishing to over but if the observer desires to upon another pace of maper.

2. Portions of the corona may probably be seen for a few seconds, both coro and after the totality. Note the exact positions are of the exact positions, observing particularly who appearances of these portions, observing particularly who appearances of the corons. Does it is gradually and how long they are visible before said after totality, and how long they are visible selected and the search in the search particularly of the corona and search in the search in the search particularly of the corona in the search in the search in the search particularly of the corona in the search in the search in the search in the search particularly of the corona in the search in

the form of this dark part, and how the light varies from it to the brighter parts.

Photographs of the corons of very considerable scientific value can probably be made win the apparatus is ordinary use by photographers. With this vio., the camera should be little with the largest and longest focused partrait lens at the operator's disposal, and then, the disposal control is the largest and longest focused partrait lens at the operator's disposal, and then, the disposal being removed, it should be most carefully feensed upon some distant object. The image will be well defined only over a small space in the centre of the ground place, but had is of no consequence. I we or fure-ministes before totality some half sized places, prepared with the most sensitive chemicals obtainable, snowly be in readiness for immediate use. The number of 'Assepiates should be equal to the number of fair ministes and the predictes duration of totality at the place occur sed by the operator. For example, if the prepared duration is 2m. Sts. then we place should be repaired the duration is 2m. Sts. then we place should be repaired. The came a should also be in readiness, directed to the sun and dued there is any convenient manner. As the sun will be high in the heavens the ordinary can ger, standard may not be available, but with a little light of the prepared of the places as possible should be put in hold-

that without this precention it will be furfor ible to say certainly which is to e top of the negative.

be difficulty in a seing the hands of the timppiece at the approach of third contacts.

Observations of the internal contacts can be utilized without a knowledge of the error of the timepiece, but with the external contacts the case in different. Here will be of no value unless the error of the timepiece, but with the external contacts the case in different. Here will be of no value unless the error of the timepiece accurately known, either or local or on Washington times a to meet this difficulty it is hoped that arrangements may be made by which the Western Union Teiegraph Commy be made by which the Western Union Teiegraph Commy will furnish, free of cost, a signal from the Nava Observatory, indicating the instant of Washington mean noon, to all preper persons who may apply for it at any of their offices on July 27, 29 and 30. The intending observer can best usilize these signals by maxing sure that the minute and second nands of his watch acree with each other, as explained above, and then carrying the watch to the telegraph office on each of the days mentioned and noting the hour, minute and second indicated by it when the signal is received. No matter how the watch may run, it must not be mendied with in any way, either by moving its hands or touching its requision between July 25 and 37. Without this precaution neither its rate nor the degree of dependence to be placed upon it can be determined.

The final record of a set of observations of contact should contain the following informetion:

1. The name of the station, including town, county and State.

2. the date.

1. The name of the station, including town, county and State.

2. The date.

3. A description of the location of the station, with refersince to the nearest prominent landmarks; as, for example, its bearing and distance from the nearest coart house, rehread station or church; or its position with respect to the lines of the United ctates land surveys; or the hearing and distance of a prominent mountain peak; or, in case of actify, the street and numer, together with the names of the nearest cross streets on each side.

4. A description of the timepiece, and a statement of the specture, focal length and magnifying power of the telescope employed.

5. The times indicated by the watch at the reception of the the shell contacts just as read from the face of the watch, without the application of any correction.

5. The stime of each of the contacts just as read from the face of the watch, without the application of any correction.

5. Any remarks which may be thought necessary.

7. An estimate of the uncertainty to which these times are liable.
8. Any remarks which may be thought necessary.
9. The arguantnes of the two observers thus:—A. B., observer with releasempe (t.) It, time numerical.
1 is particularly requested that the original pencil memorands of the times of contact be sent to the Naval Observatory, enclosed in the showe described report.
11 several parties observe the eclipse in the same neighborhood it is quite likely that their recorded times may differ a little, such differences occur even in the work of the most practised astronomers, and they must be allowed to remain. It is never permissione to alter the record. A mere asspector that such a thing has been done with insure the entire rejection of the observation.

Limits of the Shadow Path.—There is yet so much uncerin the work of the most practised streamment is a never permission to alter the record. A mere suspector that such a thing has been done with insure the entire rejection of the observation.

Limits of the Shadow Path.—There is yet so much uncertainty in the best solar and innar tables that in the eclipse of July next the firstain ephemeric places the path of the moon's shadow, while crossing tolorado, about three and a hair miles southeest of the position assigned by the American ephemeris. It is therefore important to determine accurately the true position of the path, and this may be readily accomplished by observing the duration of totality at points animated from one to ten miles within the shadow. As the duration of totality is the interval between the second and third contacts in the determined by observing these contacts in the manner already described; except that for this purpose a knowledge of the error of the watch is unnecessary, and the observations may be made with the naked eye if a telescope is not available. At places very near the edge of the shadow the totality may be as brief that the time observer would risk tostilly may be as brief that the time observer would risk tosting the third contact if he stopped to record the swood. At such places it will not the best of the forement of make the record, and the observer the second. At such places it will not the best of the forement of make the record, and the such that we are a shade second. Steches of the forement is making, now as a shade second. Steches of the forement is making, now as a shade second from wenty to forty diameters, and some necessary and the observations much should be adopted to incure accuracy of chanters in the food of the corona at a second and the consensual places of the corona and accuracy and a corresponding system drawn upon the paper on which the eketic is to be make it is donated if the comment of a carrier of the coron and the squares the lines were to be should be seen through and traced upon the grass or paper. O

PROPESSOR PARKHURST'S RET MES ON THE TOTAL ECLIPSE OF THE SUN FO-MOBROW. TO THE EDITOR OF THE HERALD:-

Two or three weeks ago a gent teman in Perceylvania, observing the planet Jupite : turough his cele-

scope, saw upon its disk a round spot which in sved across it in a little over thror , hours. It was the shadow of Jupiter's third and is rgost satellite, which was then passing between Jupy for and the sin. To-morrow alternoon, at half-pe at three o'cleak, New York time, an observer up in the planet Vepus or Mercury, observing the ear h through his telescope, would see a similar but my an amaller spot enterior upon the disk in Central As a, and, watching it for near three hours, he would a se it pass through Sibe Alasks, across the United States and the Gr Mexico, finally disapt earing at the opposite . the disk in the Carib bean Sea. This is the ar our moon, which will then pass between the our moon, which with the anadow, which we carth and the sue. Within that anadow, which we ill be about To see that eclips a astronomers have ally oclipsed. past few weeks or agregating along the path of the scopes, photographic apparatur lescopes, spectro-nomical appliance by which ap and every astronomical applian se by which the two or three prinutes of the darkness, to gain new

The questier a naturally rises, if the eclipse is only a shadow whey we camp of reach the same result by simply going, on the same and watching the direpper range of the sun behind some tall the latter case, chimney. The an reuse is this:—In the latter case, although the st m' rays do not directly fall upon us, although the strip or says do not directly fall upon us, yet they siril objects sil about us and are reflected drections; objects sil about us and are reflected directions; objects sil about us and are reflected directions; of all the rout, when the most intervenes and cuts only lose and a rays within eighty miles of us, we not but, own all the light from these beighboring objects light ref so the curvature of the barth's surface, the cle wor all traverse the thin athlosphere a mile above earth a surface. It is not to be wondered at there are that the brighter siare appear in the darkened or us, as A but recited it would be reflected back to the core that the brighter siare appear in the darkened at the traverse was the brightness of day, she dark ness (appearing all the greater because the year and the darkened at the dark day and the dark ness (appearing all the greater because the second be use rived by the unwonted phenomenon, to even to the 'sironomer, who knows beforehand ex awo never to be forgotten.

The shaw ow the satellite of Jupiter appeared as a round as a, even at the edge of the disk. And so te the observer on an interior plant; the snadow of our moon, even when it culors upon the earth and when it leaves 14 would appear round. But in fact it is at these points an extended ellipse, becoming granually fround wat it phases the point where the sun is upon the merician in the briddle of the eclipse, and of obliquity it is equally foreshortened, is any to experiment upon this on a small scale by kold.

The same as out if that surface is viewed from the same as out if the surface obliquely it is an extended. It is a series obliquely it is an extended of the captal and we will be a surface obliquely the same as out if that surface is viewed from the leavy of a surface obliquely it is an extended of the surface is viewed from the leaver. yet they siril . objects all about us and are reflected

toward the left, finally disappearing at half-past six. All this can be seen with a bit of smoked glass and the best telescopes will not show much more, although, of course, they will show it more distinctly. The interest in the colipse is not nere, although it is well worth seeing, for even a small estipace it the said said comparatively rare phenomenon at any particular locality; but the value and the interest in this colipse is within the line where the said, will be entirely hidden.

It is almost useless for me to enumerate to-day what is hoped to be done, when it will not aid in securing any useful result, and in a few days we shall know what has been done. But there are a few points of special interest which I may be excused for mentioning. Notwithstanding the confirmation given by the recent transit of Mercury te the theory of matter revolving around the agus within the orbit of Mercury, the probabilities of the existence of a planet seem now to be so small that it is unlikely that much attention will be paid to the existence of a planet seem now to be so small that it is unlikely that much attention will be paid to the coart of value of the existence of the main interest will centre upon the further investigation of the constitution of the convelope surrounding the sun, which eccasions those gorgeous rays visible during a total eclipse.

Mr. J. Norman Lockyer, the English astronomer, who has recently passed through this city on his way to Denver, well says:—"Young's work of 1809 (the last total eclipse visible on American soil) will no doubt form the Keynote of much that will be done this year, so far as the coronal atmosphere is concerned." And it is granifying to knew that the same observer, Professor Young, is now to have at his command superior means of observation, replacing the cambersome batterles of prisms in the spectroscope by the invaluable diffraction gratings constructed by Rutherlens of oxygen in the solar spectrum, may lead to discoveries of the deeper importance in that direction. We sha

CHARGED WITH BIGAMY.

A WIFE AND CHILDREN DESERTED IN VER-MONT AND AN ORPHAN GIRG MARRIED BY MUSICAL FUGITIVE.

MIDDLETOWN, N. Y., July 27, 1878. W. Frank Turner, aged thirty-five, a musician, came here from Seneca Falls a year ago and became a member of the Middletown Coract Band. Re found employment in Fuller Brothern' wool hat factory and married a respectable orphan girl, with property. bamed Alice Smith. Last December he took an interested part in the temperance movement and Froe
Christian Church, under the Rev. C. M. Winchester,
and was married by him with great extendation. A
lew weeks ago, while playing in an open-art concert,
he was recognized by a framp, a marble catter, as a
man whom he knew in a marble yard in Swahton,
V. Letters to Swahton brought replies which disclosed the fact that Turner over three years
ago deserted his wife there with three children, and that he took from Swanton three borrowed
musical instruments worin \$150. On Thursday the
owner of the instruments came to Middleiuwn
and identified Turner, who surrendered two instruments. Papers were being prepared for his
arrest for bigsmy, when Turner escaped last night,
It is supposed be has gone to Canada, and that
he was an Englishman and a descript from the
British army, he is live ices four inches to neight
and of light complexion. His Vermon wite was lary
A. Kneeland, of Waitesville. She is now living in
Kanass with four children, one born sherily after
Turner left her. The Middletown wife is in delicate
health. named Alice Smith. Last December he took an in-

ROBBING A SOPRANO.

The residence of Miss Amanda Carison, the soprage of the Swedish Lady Quartet, who lives in First place, near Smith street, Brooklyn, was burglarously entered on Friday last during her absence. A gold watch and locket were stolen from the premises. A valuable wardrobe was packed up ready for removal and left by the threves, who were doubtless alarmed while at their work, the police are of the opinion that the variety was committed by pediers, for whom they are looking.